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9-1 Study Guide and Intervention

Simple Events

The **probability** of a simple event is a ratio that compares the number of favorable outcomes to the number of possible outcomes. Outcomes occur at **random** if each outcome occurs by chance.

Two events that are the only ones that can possibly happen are **complementary events**. The sum of the probabilities of complementary events is 1.

Example 1 **What is the probability of rolling a multiple of 3 on a number cube marked with 1, 2, 3, 4, 5, and 6 on its faces.**

$$P(\text{multiple of 3}) = \frac{\text{multiples of 3 possible}}{\text{total numbers possible}}$$

$= \frac{2}{6}$ Two numbers are multiples of 3: 3 and 6.

$= \frac{1}{3}$ Simplify.

The probability of rolling a multiple of 3 is $\frac{1}{3}$ or about 33.3%.

Example 2 **What is the probability of *not* rolling a multiple of 3 on a number cube marked with 1, 2, 3, 4, 5, and 6 on its faces?**

$P(A) + P(\text{not } A) = 1$

$\frac{1}{3} + P(\text{not } A) = 1$ Substitute $\frac{1}{3}$ for $P(A)$.

$-\frac{1}{3} \qquad -\frac{1}{3}$ Subtract $\frac{1}{3}$ from each side

$P(\text{not } A) = \frac{2}{3}$ Simplify.

The probability of *not* rolling a multiple of 3 is $\frac{2}{3}$ or about 66.7%.

Exercises

A set of 30 cards is numbered 1, 2, 3, ..., 30. Suppose you pick a card at random without looking. Find the probability of each event. Write as a fraction in simplest form.

1. $P(12)$

2. $P(2 \text{ or } 3)$

3. $P(\text{odd number})$

4. $P(\text{a multiple of 5})$

5. $P(\text{not a multiple of 5})$

6. $P(\text{less than or equal to 10})$

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Study the Situation

Patty and Carlos were planning to toss a coin 20 times and record the number of heads.

Patty said, "We should get 10 heads."

Carlos disagreed. He said, "I expect we will get something close to that, but all 20 tosses could come up heads."

Who do you think is right?

Let's Find Out

Toss a coin 20 times and record the outcomes in the table.

Number of Tosses	Toss #1	Toss #2	Toss #3	Toss #4	Toss #5	Toss #6	Toss #7	Toss #8	Toss #9	Toss #10	Toss #11	Toss #12	Toss #13	Toss #14	Toss #15	Toss #16	Toss #17	Toss #18	Toss #19	Toss #20
Heads or Tails?																				

Follow-up Questions

Use mathematical evidence to answer the following questions in complete sentences. Provide details to support your answer.

1. Why would Patty think they should get 10 heads?

2. Do you think it is possible to get 20 heads in 20 tosses? Why or why not?

3. Using your data from the table, how many heads did you get? What was the percent? Is this what you expected? Why or why not?

4. What did you learn from this experiment about probability?

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5. Using the whole classes' data, how many heads did you get? What was the percent? Is this what you expected? Why or why not?

Person	# of heads
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

Person	# of heads
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	

6. What did you learn about experimental probability compared to theoretical probability from this experiment?

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9-1 Skills Practice

Simple Events

A set of 12 cards is numbered 1, 2, 3, ...12. Suppose you pick a card at random without looking. Find the probability of each event. Write as a fraction in simplest form.

1. $P(5)$

2. $P(6 \text{ or } 8)$

3. $P(\text{a multiple of } 3)$

4. $P(\text{an even number})$

5. $P(\text{a multiple of } 4)$

6. $P(\text{less than or equal to } 8)$

7. $P(\text{a factor of } 12)$

8. $P(\text{not a multiple of } 4)$

9. $P(1, 3, \text{or } 11)$

10. $P(\text{a multiple a } 5)$

The students at Job's high school were surveyed to determine their favorite foods. The results are shown in the table at the right. Suppose students were randomly selected and asked what their favorite food is. Find the probability of each event. Write as a fraction in simplest form.

Favorite Food	Responses
pizza	19
steak	8
chow mein	5
seafood	4
spaghetti	3
cereal	1

11. $P(\text{steak})$

12. $P(\text{spaghetti})$

13. $P(\text{cereal or seafood})$

14. $P(\text{not chow mein})$

15. $P(\text{pizza})$

16. $P(\text{cereal or steak})$

17. $P(\text{not steak})$

18. $P(\text{not cereal or seafood})$

19. $P(\text{chicken})$

20. $P(\text{chow mein or spaghetti})$

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9-1 Practice

Simple Events

A set of cards is numbered 1, 2, 3, ... 24. Suppose you pick a card at random without looking. Find the probability of each event. Write as a fraction in simplest form.

1. $P(5)$
2. P(multiple of 4)
3. P(6 or 17)
4. P(not equal to 15)
5. P(not a factor of 6)
6. P(odd number)

COMMUNITY SERVICE The table shows the students involved in community service. Suppose one student is randomly selected to represent the school at a state-wide awards ceremony. Find the probability of each event. Write as a fraction in simplest form.

7. P(boy)
8. P(not 6th grader)
9. P(girl)
10. P(8th grader)
11. P(boy or girl)
12. P(6th or 7th grader)
13. P(7th grader)
14. P(not a 9th grader)

Community Service	
girls	15
boys	25
6th graders	20
7th graders	8
8th graders	12

MENU A delicatessen serves different menu items, of which 2 are soups, 6 are sandwiches, and 4 are salads. How likely is it for each event to happen if you choose one item at random from the menu? Explain your reasoning.

15. P(sandwich)
16. P(not a soup)
17. P(salad)

18. **NUMBER CUBE** What is the probability of rolling an even number or a prime number on a number cube? Write as a fraction in simplest form.
19. **CLOSING TIME** At a convenience store there is a 25% chance a customer enters the store within one minute of closing time. Describe the complementary event and find its probability.

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9-2 Study Guide and Intervention

Sample Spaces

A game in which players of equal skill have an equal chance of winning is a **fair game**. A **tree diagram** or table is used to show all of the possible outcomes, or **sample space**, in a probability experiment.

Example 1 WATCHES **A certain type of watch comes in brown or black and in a small or large size. Find the number of color-size combinations that are possible.**

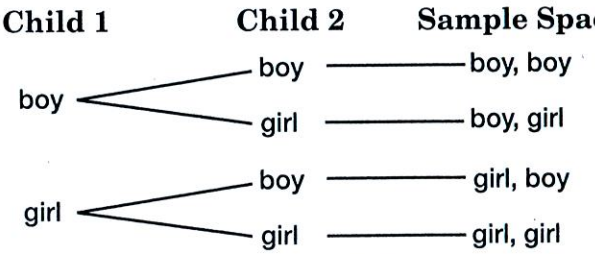
Make a table to show the sample space. Then give the total number of outcomes.

Color	Size
Brown	Small
Brown	Large
Black	Small
Black	Large

There are four different color and size combinations.

Example 2 CHILDREN **The chance of having either a boy or a girl is 50%. What is the probability of the Smiths having two girls?**

Make a tree diagram to show the sample space. Then find the probability of having two girls.



The sample space contains 4 possible outcomes. Only 1 outcome has both children being girls. So, the probability of having two girls is $\frac{1}{4}$.

Exercises

For each situation, make a tree diagram or table to show the sample space. Then give the total number of outcomes.

1. choosing an outfit from a green shirt, blue shirt, or a red shirt, and black pants or blue pants

2. choosing a vowel from the word COUNTING and a consonant from the word PRIME

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9-2 Practice

Sample Spaces

For each situation, find the sample space using a table or tree diagram.

1. choosing blue, green, or yellow wall paint with white, beige, or gray curtains

2. choosing a lunch consisting of a soup, salad, and sandwich from the menu shown in the table.

Soup	Salad	Sandwich
Tortellini Lentil	Caesar Macaroni	Roast Beef Ham Turkey

3. **GAME** Kimiko and Miko are playing a game in which each girl rolls a number cube. If the sum of the numbers is a prime number, then Miko wins. Otherwise Kimiko wins. Find the sample space. Then determine whether the game is fair.

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9-2 Word Problem Practice

Sample Spaces

1. GASOLINE Craig stops at a gas station to fill his gas tank. He must choose between full-service or self-service and between regular, midgrade, and premium gasoline. Draw a tree diagram or table showing the possible combinations of service and gasoline type. How many possible combinations are there?

2. COINS Judy tosses a coin 4 times. Draw a tree diagram or table showing the possible outcomes. What is the probability of getting at least 2 tails?

3. COINS In Exercise 2, what is the probability of getting 2 heads, then 2 tails?

4. EQUIPMENT The computer accessory that Joanne is considering selling at her store comes in white, beige, gray, or black and as an optical mouse, mechanical mouse, or trackball. How many combinations of color and model must she stock in order to have at least one of every possible combination?

Lesson 9–2

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9-3 Study Guide and Intervention

The Fundamental Counting Principle

If event M can occur in m ways and is followed by event N that can occur in n ways, then the event M followed by N can occur in $m \times n$ ways. This is called the **Fundamental Counting Principle**.

Example 1 **CLOTHING** **Andy has 5 shirts, 3 pairs of pants, and 6 pairs of socks. How many different outfits can Andy choose with a shirt, pair of pants, and pair of socks?**

number of shirts		number of pants		number of socks		total number of outfits
5	·	3	·	6	=	90

Andy can choose 90 different outfits.

Exercises

Use the Fundamental Counting Principle to find the total number of outcomes in each situation.

1. rolling two number cubes

2. tossing 3 coins

3. picking one consonant and one vowel

4. choosing one of 3 processor speeds, 2 sizes of memory, and 4 sizes of hard drive

5. choosing a 4-, 6-, or 8-cylinder engine and 2- or 4-wheel drive

6. rolling 2 number cubes and tossing 2 coins

7. choosing a color from 4 colors and a number from 4 to 10

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9-3 Skills Practice

The Fundamental Counting Principle

Use the Fundamental Counting Principle to find the total number of outcomes in each situation.

1. rolling two number cubes and tossing one coin

2. choosing rye or Bermuda grass and 3 different mixtures of fertilizer

3. making a sandwich with ham, turkey, or roast beef; Swiss or provolone cheese; and mustard or mayonaise

4. tossing 4 coins

5. choosing from 3 sizes of distilled, filtered, or spring water

6. choosing from 3 flavors of juice and 3 sizes

7. choosing from 35 flavors of ice cream; one, two, or three scoops; and sugar or waffle cone

8. picking a day of the week and a date in the month of April

9. rolling 3 number cubes and tossing 2 coins

10. choosing a 4-letter password using only vowels

11. choosing a bicycle with or without shock absorbers; with or without lights; and 5 color choices

12. a license plate that has 3 numbers from 0 to 9 and 2 letters

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Chapter 9: Probability

Bringing It All Together #1

Vocabulary Check

Word Bank		
Complementary events	Outcome	Probability
Random	Sample space	Tree diagram

Choose the term from the word bank that best completes the sentence.

1) A(n) _____ is a possible result.

2) The set of all possible outcomes is called the _____.

3) A(n) _____ is one of two events that are the only ones that can possibly happen and the sum of whose probabilities is 1.

4) The chance of an event happening is called _____.

5) Another way to display the sample space is by using a(n) _____.

6) Define **Fundamental Counting Principle** in your own words_____

_____

State whether the statement is *true* or *false*.
If *false*, replace the underlined word or number to make a true sentence.

7) A <u>random</u> outcome is an outcome that occurs by chance. _____

8) P(not A) is read "the <u>permutation</u> of the complement of A." _____

9) The Fundamental Counting Principle counts the number of possible outcomes using the operation of <u>addition</u>. _____

10) The <u>sample space</u> of an event is the set of outcomes not included in the event. ___

OVER ⟶

For questions 11-15, find the probability of drawing an animal cracker from a box of animal crackers at random. Write as a fraction in simplest form.

A box of animal crackers contains 5 monkeys, 4 giraffes, 6 elephants, and 3 tigers.

_____11. *P*(monkey)

_____12. *P*(tiger)

_____13. *P*(giraffe or elephant)

_____14. *P*(*not* monkey)

_____15. *P*(monkey, giraffe, or elephant)

For questions 16-18, use the chart regarding the boarders at a kennel that are made up of the following dogs. If one dog is randomly selected for a 30-minute training session, find the probability of each event. Write as a fraction in simplest form.

_____16. *P*(female)

_____17. *P*(*not* pointer)

_____18. *P*(pointer or retriever)

Boarders	
Males	10
Females	14
Pointers	6
Retrievers	18

For questions 19-21, find the probability of the event. Write as a fraction in simplest form.

_____19. The probability that a plane will arrive at the airport on time is $\frac{23}{24}$.
Find the probability that the plane will *not* arrive on time.

_____20. A set of 8 cards is number 1, 2, 3….
Find the probability of picking a 1 or 7.

_____21. A set of 24 cards is number 1, 2, 3….
Find the probability of picking *not* a factor of 6.

OVER⟶

For questions 22-24, find the sample space for each situation using a table or tree diagram. (3 points each)

_____22. Rolling a cube and tossing a coin

_____23. Choosing from pepperoni, mushroom, or cheese pizza and water, juice, or milk

_____24. Choosing a sandwich that can be made with ham or turkey on rye, white, or sourdough breads

OVER⟶

For questions 25-34, use the Fundamental Counting Principle to find the total number of outcomes in each situation.

_____25. Rolling two number cubes

_____26. Creating an outfit from 6 different shirts and 4 different pants

_____27. Tossing 4 coins

_____28. Choosing one of each kind of pet from 8 hamsters, 3 guinea pigs, and 10 gerbils

_____29. The total number of sharks tagged in 6 days by 8 scientists if each scientist tags 3 new sharks every day

_____30. Buying bedroom furniture if you can select one each from 7 dressers, 4 beds, 6 lamps, and 9 night tables

_____31. Choosing from 35 flavors of ice cream; one, two, or three scoops; and sugar or waffle cone

_____32. Choosing a 4-letter password using only vowels

_____33. Rolling 3 number cubes and tossing 2 coins

_____34. A tuxedo shop offers a tuxedo in three colors: black, gray, and white. The tie can be a bow tie or a regular tie. The tuxedo can come with tails or no tails. If a tuxedo is selected at random, what is the probability that it will be black, with a bow tie, and no tails?

FINALLY DONE